City of Pataskala
Utility Department
2016 Water Reclamation Facility Report

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- Nathan Coey

Utility Superintendent:
- Ryan Brown

Utility Operators and Utility Field Technicians:
- Eric Winkler
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- Stephanie Tallman

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- Steve Crane

Message from the Utility Director

I am pleased to share with you the 2016 Water Reclamation Facility Report. I would like to use this opportunity to share with you the City of Pataskala's Water Reclamation Facility treatment process. Our staff is diligent in operational procedures to ensure the highest quality of reclaimed water to our customers in a safe, economical, and environmentally friendly approach. Our staff is the first line of defense protecting our water and our environmental water resources. Not only do we strive to provide excellent water reclamation we also strive to provide excellent customer service to repair, replace, and revitalize our "liquid" investments with minimal disruption of service to you the customer. Our staff spends countless hours on facility operation and maintenance, collection system service and maintenance, and billing and customer service related duties to ensure the highest quality of service to you.

On behalf of the City of Pataskala's Mayor, City Council, City Administration and the employees of the Utility Department I am pleased to present our 2016 Water Reclamation Facility Report. Our efforts ensure the highest quality of reclaimed water to the South Fork Licking River which is used for recreational purposes and eventually becomes drinking water supply for other communities. We seek to be proactive and exceed the Ohio Environmental Protection Agency's expectations on all treated water. I invite you to read this report and learn more about your Utility Department.

Highest Regards,

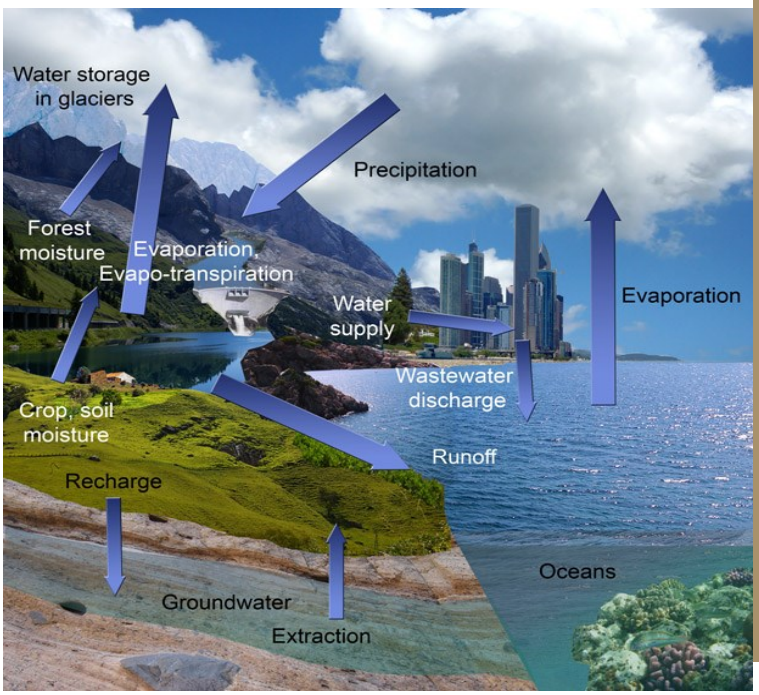
Nathan W. Coey
Utility Director
740-927-4134
ncoey@ci.pataskala.oh.us

The Water Cycle

Information provided by the USGS:

The Earth's water is always in movement, and the natural water cycle, also known as the hydrologic cycle, describes the continuous movement of water on, above, and below the surface of the Earth. Water always changes states between liquid, vapor, and ice, with these processes happening in the blink of an eye and over many years. Everyday the water cycle is in movement. Twenty thousand feet above the earth's surface, water molecules change from vapor to liquid in a storm cloud. The water falls to earth as precipitation, precipitation soaks into the earth, flows to rivers, streams, and oceans. In Pataskala the precipitation flows into underground aquifers, which is our water supply source. The ground water is treated by our Water Treatment Plants and distributed to our customers. After the water is used for drinking, cleaning, cooking, and sanitary uses the polluted water is drained to sanitary sewer main lines and sent to our Water Reclamation Facility. The wastewater is cleaned, disinfected and discharged to the South Fork Licking River. After leaving the Water Reclamation Facility the water has begun its trip back to nature, and ultimately the water flows to the Great Mississippi and eventually to the Gulf of Mexico. Along the way the water may be used for other Cities as a source of drinking water and it may evaporate into the atmosphere and return again to the earth to replenish the water resources of the earth. Our Public Water Reclamation Facility is a critical part of the water cycle; water is a finite resource, and must be protected.

Did you Know? About 70% of the earth's surface is covered with water, 97% of the water on earth is salt water which is not potable and difficult to treat, 2% is bound in glacial ice, and less than 1% of all of earth's water is fresh water that can be utilized for consumption.



Utility Department Contacts

Director's Office:

740-927-4134

Utility Billing Office:
740-964-6275

24 Hour Utility Emergency:
740-927-6867

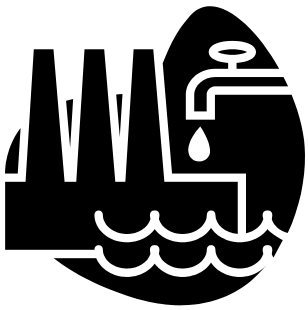
Water Reclamation Facility:
740-927-7739

Water Plant:
740-919-4394

For information regarding the treatment process, tours, future system plans, or how to participate in decisions concerning your Utility Department please call the Utility Office at 740-964-6275. Concerns about the Utility Department may also be addressed at the City Council Meetings, which are held on the 1st and 3rd Monday's each month.

What is Water Reclamation and What does it mean to me?

"Out of sight, out of mind" is often the attitude many of us resort to when his relates to flushing the toilet, draining the bath tub, or running the dish washer. The water that drains from your home does go somewhere- here in Pataskala it flows to a conventional modern Water Reclamation Facility. Proper sanitary disposal of human wastes have not always been the standard that we enjoy today. Up until the mid– 1800's it was common practice to simply dump chamber pots and garbage into street side gutters, ditches and cesspits. When Louis Pasture discovered that micro-organisms in raw sewage made people sick, cities began developing sewer systems to divert human wastes away from towns. Even 50 years ago, it was common for communities to directly channel untreated wastes into rivers and lakes. The Clean Water Act (CWA) was passed in 1972 created the frame work to govern against pollution. The CWA established guidelines to reduce and eliminate the release of toxic substances that pollute bodies of water that are used for recreational purposes. The CWA brought environmental pollution from human and industrial wastes to the attention of all people. People began to understand the connection between human health and the overall health of our surrounding environment. People also began to understand that the polluted water was also a source of drinking water for many communities.



We ALL create Wastewater

Think for a minute how many daily bodily functions, personal hygiene actions, food preparation, and manufacturing processes require the use of water. Now think that every function that uses water also "wastes" water by going down a drain after the water was used-what would happen if you did not have a drain-how would your life change. The water that flows out of a tap or faucet is clean, potable and safe for drinking. After washing hands, taking a shower, washing dishes, and flushing the toilet; that water is no longer potable as it is now a vessel to remove and "wash away" the dirty or polluted water. In America today the national average water usage is anywhere from 75 to 110 gallons per person per day. Water used for washing or consumption eventually becomes wastewater, and water is not used up or permanently goes a way (see water cycle on page 1). When water is used for our desired means it becomes wastewater-or commonly known as sewage (derived from the Latin work exaquare "to drive out water"), either way it is 99% water. All water, in one form or another is recycled-the finite amount of water is used over and over for year and years. Many years ago wastewater was removed and out of site and that was assumed that it would just disappear and the problem was solved. Our wastewater must be cleaned and treated before it is released to our local rivers and streams. Properly recycled water is a best and only way to maintain sustainable supplies of safe drinking water for future generations.

"Salute Your Toilet"

"Take a good look at your toilet. Have you ever really thought about how it works? It may not look like much, but it's an engineering marvel. The bathroom is a place you visit roughly 6 times a day, whether it's to use the toilet, take a shower or bath, or wash your hands or face. So next time you're in there, watch the water swirl down the drain or the toilet bowl. Notice how easy it is to turn your faucet on and off, and how quickly the water that comes out warms up or cools down. While in the bathroom ask yourself, If I had to choose, which would I rather live without: my computer or my toilet? Practically everyone has heard of Thomas Edison, inventor of the electric light bulb. Who has ever heard of Alexander Cummings, inventor of the modern flush toilet? Well, now you have. Throughout human history the most successful civilizations have been those that paid attention to plumbing. In contrast the improper disposal of human waste has led to very bad consequences, namely, wars, disease, grisly deaths, insect trouble, plagues, high infant mortality, heavy alcohol consumption, shortened stature, shortened life spans, cave-ins, explosions, asphyxiation, peasant revolts, and collapsed empires."

Sarah Albee *A History of the World from bottom up*

The City of Pataskala has a current Ohio EPA National Pollutant Discharge Elimination System (NPDES) Permit (4PB00009*JD) for treated water discharge to the South Fork of the Licking River. Our Permit establishes the authorized discharge limitations and monitoring requirements to maintain a healthy aquatic environment at the receiving stream. The table below gives yearly averages and pollutant removal rates through the Water Reclamation Facility.

2016 WRF Averages and Reductions

	Influent	Effluent	Removal Rate	Influent	Effluent	Removal Rate
Parameter	TSS	TSS	TSS Reduction	CBOD	CBOD	CBOD Reduction
Unit	Average mg/l	Average mg/l	%	Average mg/l	Average mg/l	%
January	266.67	8.81	96.70	215.00	5.0	97.67
February	154.67	7.68	95.03	174.50	5.0	97.12
March	152.53	1.75	98.86	170.00	3.0	98.24
April	181.33	2.03	98.88	170.00	2.6	98.50
May	161.15	3.62	97.76	238.69	3.4	98.59
June	219.23	0.34	99.85	321.54	1.8	99.44
July	220.83	0.33	99.85	301.42	1.4	99.54
August	180.00	1.97	98.90	211.67	2.3	98.92
September	188.57	0.57	99.70	208.57	1.5	99.29
October	215.75	2.87	98.67	299.09	2.6	99.12
November	271.67	4.20	98.45	225.00	4.0	98.20
December	145.85	2.95	97.97	163.93	2.5	98.46
Year Average	**196.52**	**3.09**	**98.43**	**224.95**	**2.9**	**98.70**

	Influent	Effluent	Removal Rate	Influent	Effluent	Removal Rate
Parameter	N., Ammonia	N., Ammonia	NH3N Reduction	TP	TP	TP Reduction
Unit	Average mg/l	Average mg/l	%	Average mg/l	Average mg/l	%
January	24.30	0.04	99.84	3.97	2.00	49.75
February	26.00	0.15	99.44	4.44	2.23	49.72
March	13.00	0.05	99.61	2.43	1.83	24.77
April	18.30	0.08	99.58	4.00	2.40	40.00
May	24.20	0.14	99.44	4.15	3.50	15.76
June	27.80	0.06	99.78	4.98	3.35	32.81
July	21.00	0.18	99.15	4.08	3.45	15.50
August	24.50	0.76	96.90	4.20	3.20	23.76
September	30.05	0.14	99.52	3.69	3.07	16.62
October	31.15	0.10	99.67	4.24	4.00	5.49
November	30.20	0.22	99.28	4.08	3.72	8.88
December	26.30	0.09	99.68	3.59	2.83	21.06
Year Average	**24.73**	**0.1665**	**99.33**	**3.99**	**2.96**	**25.64**

The Ohio EPA requires that our WRF meet the following requirements under treatment standards that CBOD (Carbonaceous Biological Oxygen Demand) and TSS (Total Suspended Solids) meet an **85%** removal from influent levels to final treatment levels. The 2016 removal average for CBOD is **98.7%** and TSS is **98.43%.** The Nitrogen, Ammonia removal rate was **99.33%** . We are currently exceeding the expectations of our treatment level under the OEPA's current standards. In our pursuit of treatment excellence and vigilant efforts to ensure OEPA water quality standards the WRF staff conducted over 5,000 laboratory tests in 2016. The WRF treated a total of 254.58 million gallons during the course of 2016 with an average daily flow of .7 million gallons

***CBOD = Carbonaceous Biological Oxygen Demand, strength of the organics in the water, Monthly Average limit 10**

***TSS= Total Suspended Solids, solids in the water, monthly average must be 12** **TDS: Dissolved Solids-impacts aquatic life, monthly average must be 1816**

***NH3N= Nitrogen Ammonia, content of ammonia in the water, found in human waste, lower the number on the effluent less impact on the stream, Monthly Average limit 1.3**

***TP= Total phosphorus, content of phosphorus in the water, found in human waste, lower the number on the effluent less impact on the stream**

The Water Reclamation Facility Treatment Facility

City of Pataskala WRF Aerial Image

The storage building showed above allows for significant cost savings in utilizing our biosolids for beneficial reuse on local farm fields. The biosolids provide excellent nutrients for crops and serves as a soil conditioner. In 2016 123 dry tons or 1,740,000 pounds of nutrient rich biosolids were beneficially used on local farm fields.

The Water Reclamation Facility Treatment Process

All the wastewater or sewage in Pataskala is delivered to the Water Reclamation Facility through a series of main line pipe, service lines, lift stations (7), and sanitary manholes (774). The City of Pataskala has a net work of underground pipe lines consisting of 38 miles of main line to convey the sewage in a sanitary means away from homes and businesses for treatment and ultimate release back in to the Water Cycle after proper treatment.

Influent Screening Building

Influent Screen

The reclamation process begins with all sewage delivered via pumps to the influent screening building. Here the raw sewage flow is continually monitored by flow meters and an automatic sample collection device for laboratory testing. All sewage is screened to remove all common sewage debris. The debris consist of a wide range of material including building materials, hygiene products, and miscellaneous in-organic sewer debris. These items must be removed to eliminate flow blockages in the treatment process and to prevent premature equipment wear and failure.

Screened and washed debris

Oxidation Ditch / bio-reactor

Oxidation Ditch / bio-reactor

Disk aerators

After the screening process all sewage is diverted to the Oxidization Ditch which is a version of the conventional extended aeration process. The sewage is introduced in to the tank and mixed with activated sludge, to create a aqueous substance known as mixed liquor suspended solids. Activated sludge is a suspended growth treatment process in which specific aerobic microbiology is cultivated and controlled. A healthy microbiology population thrives in our oxygen, pH, and food controlled environment. The food source for the microbiology are compounds found in raw sewage. This treatment process ensures all organic compound levels are reduced to meet environmental expectations prior to introduction back into the water cycle.

Disk aerators drive units

Wet Stream Reclamation Process

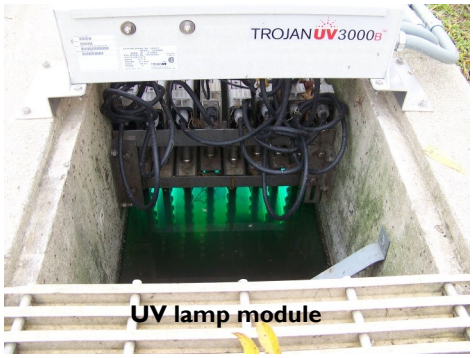
South Secondary Clarifier

North Secondary Clarifier

Once a treatment derived detention time has been met and treatment completed in the oxidation ditch the mixed liquor suspended solids (MLSS) flows by gravity to the two secondary clarifiers. Clarifiers allow for a separation of the clear treated water from the MLSS; in these tanks a physical settling and separation occurs. The solids will settle to the tank bottom, and serve as a gravity filtration process in which the clear, treated water flows out of the tanks for further effluent treatment. As the solids settle in the conical floor of the tank the activated sludge is concentrated and collected. During this process the microbiology in the activated sludge no longer has a free food source and hungry bugs are returned (via pump system) back to the Oxidation Ditch to continue in the activated sludge treatment process. The clarifiers play a pivotal role in the complete water reclamation process. The effluent "Wet Stream" is the clean, clear effluent water from the clarifier that flows to the effluent treatment portion of the process. Additionally the "Solids Stream", collected activated sludge from the clarifiers, requires further treatment of the activated sludge.

Effluent treatment structure

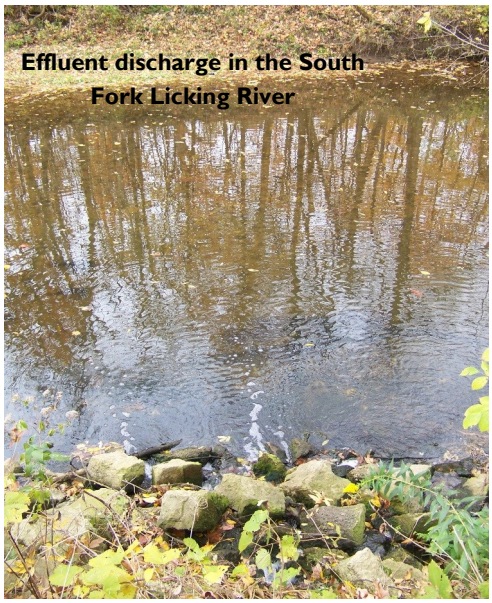
UV Disinfection Channel



UV lamp module

Step aeration system

Reclaimed (treated) water from the clarifiers flows to the effluent discharge station. The effluent flow is continually monitored by a flow meter and an automatic sample collection device for laboratory testing. During the summer months, May 1st through October 31st the OEPA requires that we disinfect all effluent water. The WRF utilizes the UV (Ultra-Violet) Disinfection Process in which high-intensity UV lamps are submerged into the effluent flow. The UV system effectively sterilizes all pathogenic bacteria, if bacteria like Escherichia coli (E-coli) can not reproduce they die. The effluent water is then treated to increase the Dissolved Oxygen content by a Step Aeration System prior to discharge. The Dissolved Oxygen content of the effluent provides an excellent product to encourage healthy aquatic life in the South Fork Licking River. The WRF is engineered to provide high quality reclaimed water back into to the water cycle.


Effluent discharge in the South Fork Licking River

Solids Stream Reclamation Process

Gravity Thickener Tank

In order to maintain an healthy micro-biology flora activated sludge is removed from the Wet Stream Process. This is referred to Waste Activated Sludge (WAS). The calculated removal rate is conducted to ensure specific predominance of micro-biology to provide sufficient treatment. The WAS is pumped to a Gravity Thickener Tank to allow the waste solids to settle out and concentrate; additionally the separated water is removed from the Solids Stream process. It is pivotal in an Solids Stream Process to increase the solids concentration of the sludge or remove as much bound water as possible from the sludge. The goal of the thickening stage is to increase the solids percent from less than .5% to 2%.

Gravity Thickener Tank

Aerobic Digester Tank

Rotary Fan Sludge Press

After concentration in the Gravity Thickener the waste activated sludge is pumped to the aerobic digesters. The bacterial digestion process occurs under the presence of supplied oxygen and mixing from positive displacement blowers. The digester creates an environment in which the bacteria consumes organic matter and coverts it to carbon dioxide. Eventually due to a lack of organic matter (bacteria food) bacterial organisms die and become food for other bacteria. Upon digestion the sludge is further concentrated (bound water removal) through a Rotary Fan Press. The press utilizes cationic polymers (to expel bound water) and mechanical equipment to increase the sludge percent content to 14% solids. Dewatered sludge (cake) can be stored for disposal in a landfill, composting, or used as a fertilizer compound for agricultural operations. The higher the percent solids concentration equates to reduced hauling cost by volume.

Cake Sludge Storage Building

Cake Sludge Storage Building

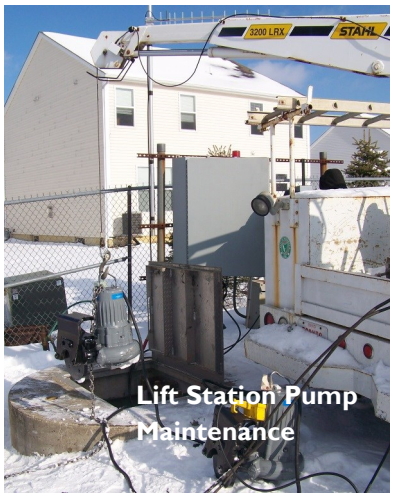
Sanitary Sewer Main Line System Maintenance

As a Pataskala Utility Customer your home or business has a service line that connects to a sanitary sewer main line. As a home or business owner in the City of Pataskala you have property assets in the form of utility service lines. Utility lines that serve your property are the responsibility of the homeowner outside of the easements for the utilities, which is usually a few feet from the edge of a public roadway. Your private service lines can be subjected to failure similar to main lines. Failures can happen to private and public utility systems at any time, and often without a warning sign. Often failure on the private and/or public utility system often equates to an unpleasant outcome. Failures can lead to basement flooding, pipe freezing, sewage back up, and equipment / appliance failure.

The City of Pataskala Utility Department takes seriously the responsibility to provide to you, our customer the necessary services in the form of wastewater removal and treatment. Unfortunately, problems can occur even with a maintenance plan in place. Our sewer infrastructures can be subjected to adversity that has the potential to cause service interruptions. We seek to be proactive in addressing the most aged portions of our infrastructure in efforts to reduce the likelihood of failure. While new equipment is often the remedy for aged equipment, new equipment can fail too. We seek to have in place redundant systems to prevent prolonged service disruption to our customers. Our goal is to provide excellent preventative and predictive maintenance to all of our assets regardless of age. Proper maintenance is one of the best forms of investment in our utility assets. In the event of failure, it is our resolve to respond quickly and then take a sound methodical approach to perform the necessary repairs. Our commitment to provide excellent sewer system service is indicated by our monthly efforts to preventively clean the main lines. Our yearly goal is to preventively clean 1/3 of our system, with resolve to have the entire system preventively cleaned in a 3 year cycle. The goal is to invest in our infrastructure system to eliminate the likelihood of sanitary sewer service disruption.

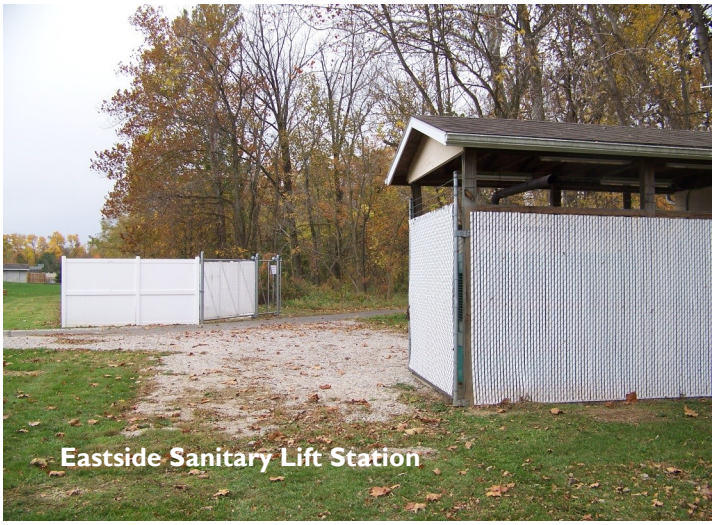
Main line cleaning efforts are necessary to keep our collection system flowing and in the best possible shape for proper service. A combination sewer truck is utilized to apply pressurized washing and cleaning of the sewer mains along with a vacuum system to remove the debris out of the main lines. Two of the biggest issues we see in our main lines are grease deposits and root intrusion from trees into the older clay pipes. Often, to effectively remove the grease and roots more pressure is applied to the main line via the trucks' pumping system. The induction of more pressure in the sewer lines can cause an atmospheric air pressure change in the mains and may cause air and / or water surges in the main line and service line. Often these surges are relieved without issues due to proper sewer ventilation but it can cause toilet water to "burp" or "gurgle" and allow water to leave the toilet bowl if a private sewer system is improperly vented. It is advised if you see our crews out or if you are not home during the day to close your toilet lid to minimize potential effects.

Lift Station Emergency Back up Pump



Lift Station Pump Maintenance

Combination Jet/ Vac Sewer Truck


Eastside Sanitary Lift Station

Creek Road Sanitary Lift Station

The City of Pataskala
Utility Department
621 W Broad Street
Pataskala, Ohio 43062

The City of Pataskala Utility Department

2016 Water Reclamation Facility Report

"We think of our land and water and human resources not as static and sterile possessions but as life-giving assets to be directed by wise provisions for future days." Franklin D. Roosevelt